

AL.1.1418

c.2



CANADIANA

NOV 22 1994

ALBERTA *Facts*

**A GUIDE TO THE
ENVIRONMENT**

1 9 9 4





he Environment Council of Alberta is a provincial Crown corporation that reports to the Alberta government through the Minister of Environmental Protection. The Council's mission is to provide long-term strategic policy advice on sustainable development and environment conservation.

If you would like more information on the Council or any of its projects, please contact:

Environment Council of Alberta

Suite 400, 9925 - 109 Street

Edmonton, Alberta T5K 2J8

Tel. (403) 427-5792

Fax. (403) 427-0388

The Environment Council of Alberta gratefully acknowledges the following corporations for sponsoring *Alberta Facts: A Guide to the Environment*

AGT Limited

Alberta Pool

Laidlaw Inc.

TransAlta Utilities Corporation



National Library
of Canada

Bibliothèque nationale
du Canada

TABLE OF CONTENTS

THE QUALITY OF AIR, WATER AND LAND

PAGE



Air Quality and Climate

Incidence of Smog in Selected Alberta Cities	3
Incidence of Smog in Selected Alberta Cities versus Other Canadian Cities	3
Emissions Profile	4
Temperature Trends in Selected Alberta Cities	5
Average Monthly Ultra Violet (UV) Index Readings	5
Stratospheric Ozone Levels, Edmonton and Two Other Locations	6



Water Quality

% Population Served by Primary, Secondary and Tertiary Sewage Treatment	7
Emissions Profile	8



Solid Waste Generation and Disposal

Estimated Composition of Municipal Solid Waste	9
Change in Municipal Solid Waste Volumes	10
Large Scale Composting Activities	10
Number of Landfills in Alberta	11
Estimated Amount of Waste Diverted from Landfills Due to Recycling	11
Landfill Reclamation	12



Hazardous Waste Generation and Treatment

Total Volumes (tonnes) Residual Special Waste	13
Residual Special Waste Treatment	13
Orphan Contaminated Sites	14

A SLICE OF LIFE



People, Plants and Animals

Population of Cities	15
Population Growth in Alberta	16
Distribution of Population	16
Urban and Rural Population	17
Employment by Industry	17
Mammals, Birds, Reptiles and Amphibians At Risk	18
Plant Species	19
Animal Species	19
Alberta Fish and Plants at Risk	19

THE CHANGING FACE OF THE LAND

PAGE



Forestry

Industry Profile	20
Harvest by Product and Species	21
Forest Inventory	21
Use of Insecticides and Herbicides in Forestry	22



Energy and Mining

Industry Profile	23
Oil and Gas	23
Electricity	23
Coal Mining	24
Other Mining	24
Cumulative Land Disturbance and Reclamation	24
Status of Oil and Gas Well Sites	25
Cutlines from Oil and Gas Seismic Exploration in Alberta's "Green Area"	25



Agriculture

Industry Profile	26
Inventory of Agricultural Land	27
Cultivated Land	27
Additions and Deletions to Agricultural Land Base	28
Estimated Area of Easily Degraded Soils Under Cultivation in Alberta	28
Use of Agricultural Chemicals	29



Urbanization and Transportation

Urban Growth	30
Urbanization of Farm Land in Canada	31



Natural Areas

Areas with Legislated Protection	32
Protected Areas	33
Natural Regions	34
Wetland Losses in Alberta's Settled Area by Natural Region	35
Inventory of Wetlands	35
Distribution of Wetlands	36

THE QUALITY OF AIR, WATER AND LAND



AIR QUALITY AND CLIMATE

INCIDENCE OF SMOG IN SELECTED ALBERTA CITIES 1990 AND 1992

The federal one hour maximum acceptable level for ground level ozone readings is 82 parts per billion.







Hours Exceeding 1-hour Ozone Maximum			Hours Exceeding 1-hour Ozone Maximum		
MONITORING STATION	1990	1992	MONITORING STATION	1990	1992
Edmonton			Calgary		
downtown	0	0	downtown	0	0
residential	1	0	residential	5	0
industrial	2	0	industrial	0	0
Fort Saskatchewan	8	0	Fort McMurray	18	0

Smog, which is mostly ozone, results from a chemical reaction among pollutants such as Volatile Organic Compounds (VOCs) and Nitrogen Oxide (NOx) in the presence of sunlight. High concentrations of ground-level ozone correlate with incidents of smog in urban areas.

Source: Air Issues and Monitoring Branch, Alberta Environmental Protection.

INCIDENCE OF SMOG IN SELECTED ALBERTA CITIES VERSUS OTHER CANADIAN CITIES

Average days per year between 1982-1986 when ground-level ozone readings were over the federal one-hour maximum acceptable level of 82 parts per billion.

Windsor		16.8 days/year
Toronto		15.4 days/year
Vancouver		7 days/year
St. John, NB		5.5 days/year
Edmonton		2 days/year
Calgary		1 day/year

Source: Clean Air Strategy for Alberta.

EMISSIONS PROFILE

EMISSION	EFFECT	SOURCE (% CONTRIBUTION)	TOTAL MASS (000 TONNES)
Carbon Dioxide (CO ₂) 1990	Greenhouse Effect (global temperature increase)	- fossil fuel production (31%) - electricity generation (31%) - fossil fuel combustion (36%) - other (2%)	130,388
Methane (CH ₄) 1990	Greenhouse Effect	- vegetation (58%) - fossil fuel production (31%) - animals (10%) - other (1%)	2,629
Nitrous Oxide (N ₂ O) 1990	Greenhouse Effect (stratospheric ozone depletion)	- vegetation (52%) - fossil fuel production & combustion (32%) - fertilizer use (15%) - other (1%)	27
Ozone-Depleting Gases eg. Chlorofluorocarbons (CFCs) 1990	Greenhouse Effect (stratospheric ozone depletion leading to increased risk of skin cancer, cataracts)	- building & vehicle air conditioning (*) - residential & commercial refrigeration (*) - fire-suppression equipment (*) - rigid foam insulation (*) - industrial solvents (*)	
Sulphur Dioxide (SO ₂) 1988	Acid Deposition (leading to higher acidity in soils & surface water)	- sour gas refining (44%) - oil sands refining (29%) - electricity generation (15%) - well-sites: sour gas and oil (9%)	590
Nitrogen Oxides (NO _x) 1988	Smog Acid Deposition	- oil and gas industry (37%) - transportation (30%) - electricity generation (17%) - agricultural fuel use (6%) - other (10%)	448
Volatile Organic Compounds (VOCs) 1990	Smog	- transportation (46%) - solvents and misc. (33%) - petroleum & petrochem ind. (16%) - other (5%)	176

* In 1990, Alberta had about 7,300 tonnes of chlorofluorocarbons (CFCs) "banked" in air conditioners, refrigerators, fire-fighting equipment and foam insulation, but their rate of release is unknown. When used as industrial solvents, all ozone-depleting substances are released, about 260 tonnes in Alberta in 1990.

Sources: *Clean Air Strategy for Alberta* (1988 numbers on sulphur dioxide and nitrogen oxides).

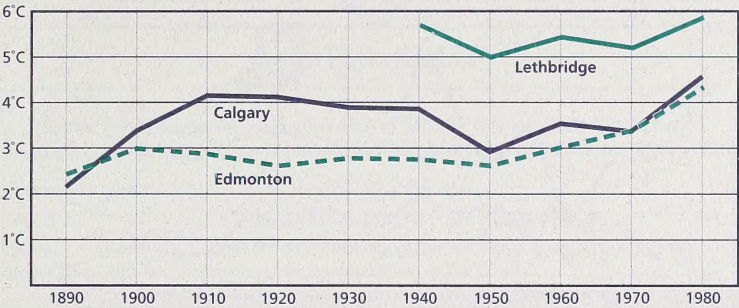
Alberta Energy and Alberta Environmental Protection, *Greenhouse Gas Emissions and Sinks Estimates 1990* (1990 numbers on carbon dioxide, methane and nitrous oxide).

Air Quality Branch, Alberta Environmental Protection (1990 information on chlorofluorocarbons and volatile organic compounds).

TEMPERATURE TRENDS IN SELECTED ALBERTA CITIES

(10-YEAR AVERAGE, °C)

Temperature shown as averages for each decade.



Source: Atmospheric Environment Service, Environment Canada.

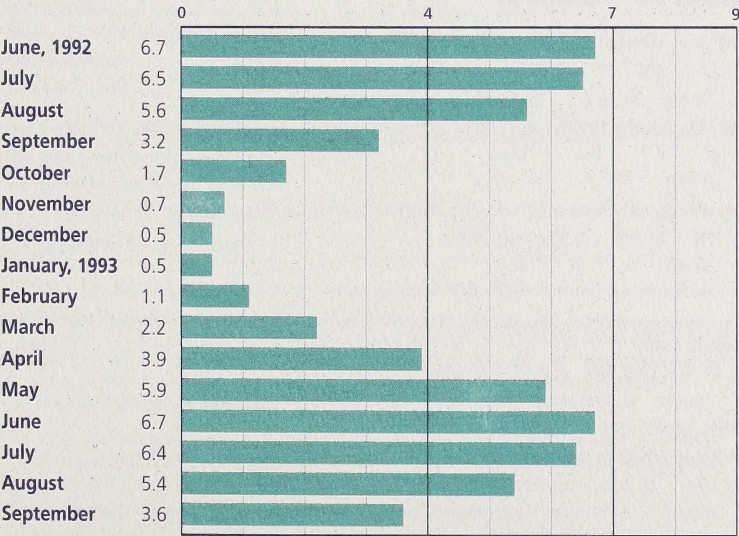
AVERAGE MONTHLY ULTRA-VIOLET (UV) INDEX READINGS

JUNE 1992- SEPTEMBER 1993

UV index:

over 9 (extreme): skin burns in less than 15 minutes
7-9 (high): about 20 minutes

4-7 (moderate): about 30 minutes
0-4 (low): more than one hour

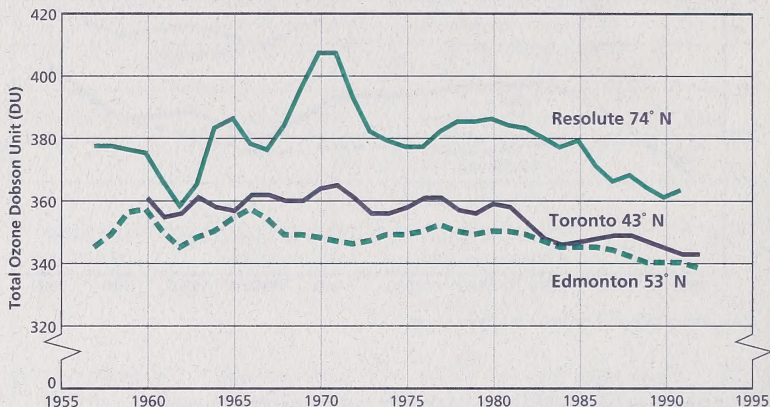


Source: Atmospheric Environment Service, Environment Canada.

STRATOSPHERIC OZONE LEVELS 1960-1991

EDMONTON AND TWO OTHER LOCATIONS

Based on data from Canada's three long-term ozone-monitoring stations.



Source: State of the Environment Reporting, Environment Canada.

What Do You Know?

What is Alberta's contribution to total Canadian CO₂ emissions?

- a) 12% b) 27% c) 32% d) 52%

Answer: b.

Alberta has the highest per capita emission rate for CO₂ within Canada. True or false?

Answer: true.

Approximately how much do cars contribute to total CO₂ emissions in Alberta?

- a) 2% b) 5% c) 8% d) 12%

Answer: c.

Source: Environmental Affairs Branch, Alberta Department of Energy.

The average number of cars per person in Canada is 0.48. What is Alberta's car-person ratio?

- a) 0.48 b) 0.50 c) 0.52 d) 0.56.

Answer: d. The Canadian and Alberta averages include private vehicles, taxis and rental cars.

Source: Statistics Canada.

What is Alberta's estimated contribution to total CFC emissions in Canada?

- a) 10% b) 20% c) 30% d) 40%.

Answer: a. Since emissions largely come from individual consumers, this is based on Alberta's proportion of Canada's population.

Source: Air Quality Branch, Alberta Environmental Protection.



% POPULATION SERVED BY PRIMARY, SECONDARY AND TERTIARY SEWAGE TREATMENT IN COMMUNITIES OVER 1000 POPULATION, 1993

Primary treatment is mechanical removal of solid wastes.

Secondary treatment is biological degradation of organic material.

Tertiary treatment is chemical treatment to remove additional contaminants such as heavy metals, phosphorous and inorganic dissolved solids.

PROVINCE	NO TREATMENT	PRIMARY	SECONDARY*	TERTIARY
British Columbia	19.8	55.5	19.1	5.6
Alberta	7.6	0.3	57.5	34.6
Saskatchewan	4.4	33.3	28.2	34.1
Manitoba	4.9	2.1	93.1	0
Ontario	10.9	11.7	12.2	65.1
Quebec	50.2	17.9	23.9	8.0
New Brunswick	32.2	16.4	51.0	0.3
Nova Scotia	79.7	0.8	19.5	0
Prince Edward Island	22.1	59.1	18.8	0
Newfoundland	86.9	6.5	6.6	0
NWT & Yukon	20.5	2.3	77.1	0
Canada Total	25.1	17.9	24.8	32.2

*includes waste stabilization ponds.

Source: Environment Canada.

What Do You Know?

What is the biggest user of water in the average Alberta home?

- a) shower b) cooking c) toilet d) dishwasher

Answer: c. The toilet represents 43% of total household water use. Other users: showering and bathing, 29%; laundry and dishwashing, 19%; drinking and cooking, 5%; other, 4%. The "other" category includes lawn and garden watering, and car washing. These can increase daily water use by 50% in summer.

Source: Alberta Environment, *Using Water Wisely*.

In 1992, the average per capita demand for water in Alberta municipalities without metering systems was 637 litres/day. What was the average demand in municipalities with metering systems?

- a) 413 l/day b) 552 l/day c) 635 l/day d) 702 l/day

Answer: a.

Source: Alberta Transportation and Utilities, *Technical Review of Water Conservation Options for Alberta Municipalities*.

EMISSIONS PROFILE, 1992

EMISSION	EFFECT	SOURCE (approximate % contribution)
organic matter (biodegradable)	<ul style="list-style-type: none"> - oxygen depletion (break down of material use up oxygen in water) - aesthetics 	municipal sewage (over 40%) pulp mills (over 40%) food proc'g plants (less than 10%)
organic matter (not readily biodegradable)	<ul style="list-style-type: none"> - aesthetics - colour (reduces light penetration & plant growth) 	petrochemical plants (over 85%) oil & gas refineries (less than 15%)
suspended solids	<ul style="list-style-type: none"> - damages spawning beds - aesthetics - reduces light penetration & plant growth 	municipal sewage (over 60%) pulp mills (less than 15%) fertilizer plants (less than 10%) petrochemical plants (less than 10%) food proc'ing plants (less than 10%) oil & gas refineries (less than 5%) agriculture (unknown)
ammonia	<ul style="list-style-type: none"> - stimulates biological growth - oxygen depletion - toxic to aquatic organisms 	municipal sewage (over 80%) fertilizer plants (approximately 10%) pulp mills (approximately 5%)
nitrate & nitrite	<ul style="list-style-type: none"> - stimulates biological growth - oxygen depletion 	municipal sewage (over 90%) fertilizer plants (approximately 5%) agriculture (unknown)
organic nitrogen	<ul style="list-style-type: none"> - oxygen depletion 	municipal sewage (over 70%) pulp mills (over 20%) fertilizer plants (less than 5%) agriculture (unknown)
phosphorus	<ul style="list-style-type: none"> - stimulates biological growth - oxygen depletion 	municipalities (approximately 70%) pulp mills (approximately 20%) fertilizer plants (less than 10%) agriculture (unknown)
pathogens (disease-transmitting organisms)	<ul style="list-style-type: none"> - disease transmission 	municipal sewage (over 95%) abattoirs, feedlots, meat packing plants (unknown)
heavy metals	<ul style="list-style-type: none"> - toxic to aquatic organisms - bioaccumulation (increasing concentration from bottom to top of food chain) 	levels relatively low in all effluents
thermal discharges	<ul style="list-style-type: none"> - reduces dissolved oxygen - stimulates biological growth - causes species shift 	pulp mills (not available) power plants (not available)
chlorinated compounds (eg. dioxins)	<ul style="list-style-type: none"> - acute & chronic toxicity - bioaccumulation - oxygen depletion 	pulp mills (over 95%) municipal sewage (trace amounts)
oil & grease	<ul style="list-style-type: none"> - aesthetics - damages spawning beds - oxygen depletion - acute & chronic toxicity 	municipal sewage (over 95%) food proc'ing plants (less than 5%)
pesticides	<ul style="list-style-type: none"> - acute & chronic toxicity - aquatic organisms - bioaccumulation 	agriculture (unknown) other sources (trace)

Total volumes (plus or minus 25%): organic matter (biodegradable and measured with biological agents), 18,000 kg/day; organic matter (less biodegradable and measured with chemical agents), 4,450 kg/day; suspended solids, 13,450 kg/day; ammonia, 11,000 kg/day; nitrate and nitrite, 5,250 kg/day; organic nitrogen, 12,500 kg/day; phosphorous, 4,000 kg/day; organic compounds (measured as chlorine ions), 1500 kg/day.

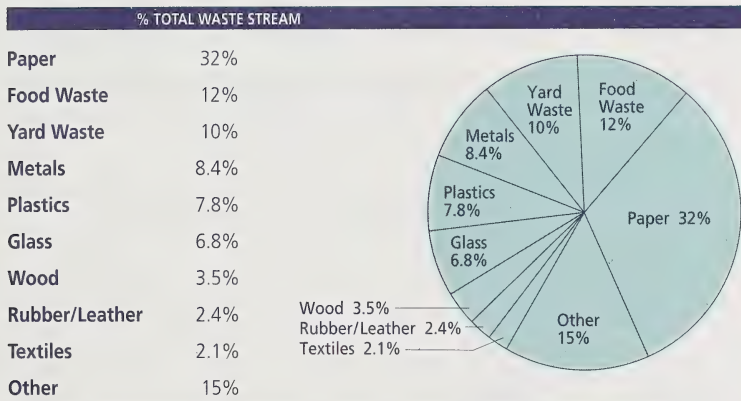
Sources: Standards and Approvals, Alberta Environment Protection.

Land Evaluation and Reclamation Branch, Alberta Agriculture, Food and Rural Development.



SOLID WASTE: Generation and Disposal

ESTIMATED COMPOSITION OF MUNICIPAL SOLID WASTE, 1991



Sources of Municipal Solid Waste: 40% residential, 60% commercial / institutional / industrial (estimate based on total waste stream).

Source: Waste Minimization Branch, Alberta Environmental Protection.
Alberta Recycling Markets Study, 1992.

What Do You Know?

Of the garbage an average Canadian generates, how much is recyclable (paper + cardboard + glass + plastic + metal)?

- a) 20-30% b) 30-40% c) 40-50% d) 50-60%

Answer: b. Between 30-40% of household garbage is recyclable. The amount actually recycled will vary according to public and private programs offered in communities.

Source: Canadian Council of Ministers of the Environment.

CHANGE IN MUNICIPAL SOLID WASTE VOLUMES, 1988-1992

	1988	1989	1990	1991	1992
landfilled waste* (000,000 tonnes)	2.12	2.08	2.15	2.15	2.02
tonne/person/yr	1.15	1.1	1.08	1.08	0.98
kg/person/day	3.14	3.02	2.95	2.95	2.67

* based on 80% of Alberta's population; 20% of the population uses landfills that have no scales or private contractors who do not report this information.

Source: Waste Assistance Branch, Alberta Environmental Protection.

What Do You Know?

How many bottle recycling depots are there in Alberta?

- a) 90 b) 150 c) 200 d) 260

Answer: c. 200 The Alberta Beverage Container Recovery Program recovers more than 75% of beverage containers, diverting approximately 400 million containers from the waste stream every year.

Source: Waste Minimization Branch, Alberta Environmental Protection.
Action on Waste, Alberta Environmental Protection.

Of the garbage Canadian households throw away, how much can be composted?

- a) 5% b) 20% c) 35% d) 45%

Answer: c. 35% of garbage, consisting of organic matter such as table scraps and yard waste, can be composted.

Source: Canadian Council of Ministers of the Environment.

LARGE SCALE COMPOSTING ACTIVITIES, 1994

- | | | | |
|----|--|---|----------------------------------|
| 20 | Municipal/Regional Composting Programs | 3 | Commercial Composting Facilities |
|----|--|---|----------------------------------|

Source: Action on Waste, Alberta Environmental Protection.

NUMBER OF LANDFILLS, 1993*

SANITARY LANDFILLS

43 (strictly controlled design
& operation)

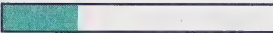

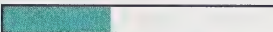
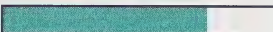
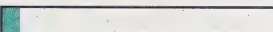
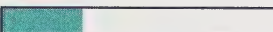

MODIFIED LANDFILLS

295 (operations with various
levels of control)

*does not include "dry" landfill sites that take wastes such as construction rubble.

Source: Alberta Health, Waste Management Master File, 1993.

ESTIMATED AMOUNT OF WASTE DIVERTED FROM LANDFILLS DUE TO RECYCLING, 1991

	QUANTITY RECYCLED	% RECYCLED FROM TOTAL WASTE GENERATED	
Paper	157,000 tonnes	28%*	
Glass	86,200-90,700 tonnes	48-55%	
Non-Ferrous Metals	19,400 tonnes	40%	
Ferrous Metals (iron/steel)	300,000 tonnes	75%	
Plastic	9,200 tonnes	7%	
Used Oil	38 million litres	30%	
Lead-acid Batteries	405,000	75%	

*(based on total paper purchased)

Source: Waste Minimization Branch, Alberta Environmental Protection.
Alberta Recycling Markets Study, 1992.

What Do You Know?

How much of the garbage an average Canadian throws out is packaging waste?

- a) 5% b) 15% c) 30% d) 45%

Answer: c. Packaging waste represents 30% of the garbage.

Source: Canadian Council of Ministers of the Environment.

What percentage of the packaging used by consumers and industries is reused each year?

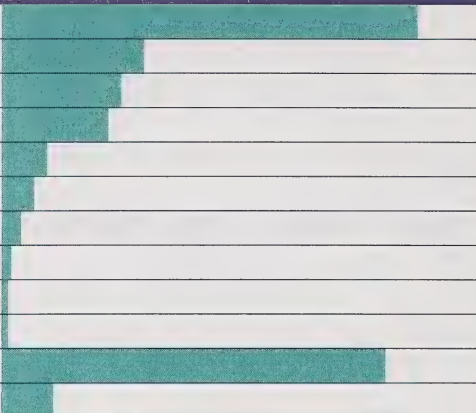
- a) less than 10% b) 10-25% c) 25-50% d) more than 50%

Answer: d. 54% of packaging used by consumers and industries is reused.

Source: Canadian Council of Ministers of the Environment.

LANDFILL RECLAMATION, 1976-1992

During 1976-92, over 415 landfills, covering a total of 2100 acres, were closed and reclaimed as follows:

END LAND USE	# OF LANDFILLS	
Agriculture	129	
Waste Mgmt Facility	44	
Natural Area	37	
Recreation	33	
Mixed Use	14	
Forest	10	
Park	6	
Wildlife Habitat	3	
Residential	2	
Industrial	2	
To be determined	119	
Other	16	

Source: Land Reclamation Branch, Alberta Environmental Protection.



HAZARDOUS WASTE: Generation and Treatment

TOTAL VOLUMES (TONNES) RESIDUAL SPECIAL WASTE, 1991

Hazardous wastes that cannot be recovered or disposed of on-site.

SECTOR	ANNUAL GENERATION	WASTES IN STORAGE	TOTAL ANNUAL VOLUME (% OF TOTAL)	
Oil & Gas Exploration & Production	21,971	13,062	35,033	(44%)
Abandoned Landfills	0	16,000	16,000	(20%)
Oil Refineries	11,978	0	11,978	(15%)
Tar Sands	2,357	2,682	5,039	(6%)
Airport/Transportation	1,483	599	2,082	(3%)
Petrochemical Plants	1,311	0	1,311	(2%)
Heavy-oil Upgraders	1,056	0	1,056	(1%)
Pulp Mills	25	0	25	(—)
Other	7,254	112	7,366	(9%)

Source: Alberta Special Waste Management Corporation.

RESIDUAL SPECIAL WASTE TREATMENT

Total residual special waste, 1991: **80,000 tonnes.**

Total treated at Alberta Special Waste Treatment Centre, Swan Hills, 1991:
8,600 tonnes.

Capacity of Swan Hills facility as of December 1993:

- incineration: **48,000 tonnes/yr.**
- chemical treatment: **5,000 tonnes/yr.**

Source: Alberta Special Waste Management Corporation.

ORPHAN CONTAMINATED SITES, 1993

Contaminated sites abandoned by their original owners that pose environmental risk because of the size, nature and duration of the former land-use. Orphan oil and gas wells are not priorities under this classification.

PRIORITY	TYPE (#)	LOCATION
national*	wood-preserving operations (3)	Faust Calgary Cayley
	refinery (1)	Black Diamond
provincial	wood-preserving operations (2)	Blackfalds Beaverlodge
	oil refineries (5)	Bonnyville Borradialle Coutts Calgary Grande Prairie
	chemical processing plants (3)	Duvernay (all 3)

Number of secondary provincial priority sites: 28.

Total number of national priority sites in Canada: 27*.

- four of these sites are in Alberta, as noted above.

* identified under the National Contaminated Sites Remediation Program.

Sources: HELP Project (Help End Landfill Pollution), Alberta Environmental Protection.
National Contaminated Sites Remediation Program, 1992-93 Annual Report.

What Do You Know?

Where does Alberta rank, compared to other provinces, in annual hazardous waste generation?

a) second b) fourth c) sixth d) eighth

Answer: b. In 1988, Alberta generated 1.6% of Canada's total volume of hazardous waste. Ontario ranked first at 68.1%, Quebec second at 22.2% and Nova Scotia third at 2.6%.

Source: Environment Canada, *State of Canada's Environment 1991*, Table 21.2.

A

SLICE OF LIFE



PEOPLE, PLANTS AND ANIMALS

POPULATION OF CITIES, 1991

	POPULATION	% PROV. TOTAL
Calgary	710,677	27.9
Edmonton	616,741	24.2
Lethbridge	60,974	2.4
Red Deer	58,134	2.3
Medicine Hat	43,625	1.7
St. Albert	42,146	1.7
Ft. McMurray	34,706	1.4
Grande Prairie	28,271	1.1
Leduc	13,970	0.5
Camrose	13,420	0.5
Spruce Grove	12,884	0.5
Airdrie	12,456	0.5
Wetaskiwin	10,634	0.4
Lloydminster (Alta. only)	10,042	0.4
Drumheller	6,277	0.2
TOTAL	1,674,957	65.7

Source: Statistics Canada, 1991 Census.

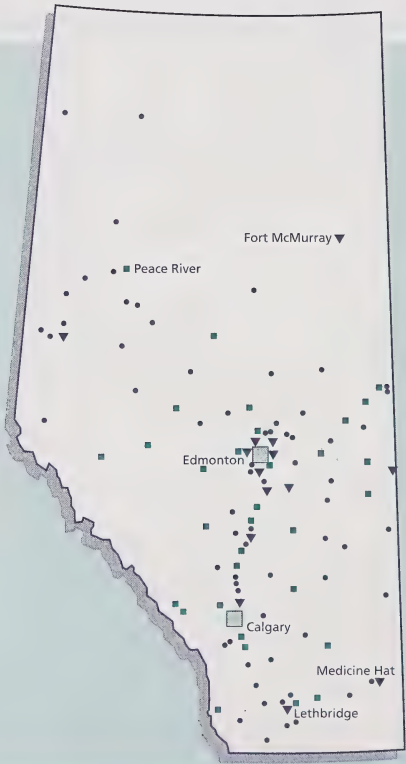
POPULATION GROWTH IN ALBERTA, 1971-1991

	1971	1981	1991
Population	1,627,875	2,237,725	2,545,550
% national population	7.5	9.2	9.3
% change (71-81,81-91)	—	37.5	13.8

Source: Statistics Canada, 1991 Census.

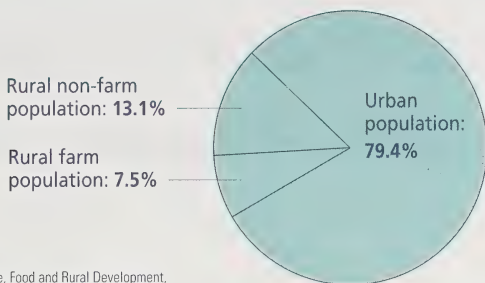
DISTRIBUTION OF POPULATION IN COMMUNITIES OF OVER 1000 POPULATION

- 1 000 to 3 999
- 4 000 to 9 999
- ▼ 10 000 to 70 000
- 400 000 and OVER



Source: Surveying and Mapping, Alberta Environmental Protection.

URBAN AND RURAL POPULATION, 1990



Source: Alberta Agriculture, Food and Rural Development,
Alberta Farm Families: A Profile, 1990.

EMPLOYMENT BY INDUSTRY, 1992

INDUSTRY	# PEOPLE EMPLOYED (000)	% OF LABOUR FORCE (%)
Community, Business & Personal Services	451	36.4%
Retail & Wholesale Trade	216	17.4%
Transportation, Storage & Communication	94	7.5%
Agriculture	89	7.2%
Construction	82	6.6%
Public Administration	80	6.5%
Manufacturing	79	6.4%
Finance, Insurance & Real Estate	64	5.2%
Petroleum, Gas & related services	60	4.8%
Forestry & related services	17	1.4%
Mining & Quarries (including Coal)	8	0.6%
Fishing & Trapping	data not available	

Source: Statistics Canada, Labour Force Survey.

MAMMALS, BIRDS, REPTILES AND AMPHIBIANS AT RISK, 1991

According to Alberta Fish and Wildlife's *The Status of Alberta Wildlife, 1991*.

- **Red List:** species with populations that are non-viable.
- **Blue List:** species at risk, but facing less immediate threats. This list also includes species suspected of being at risk, but for which information is too limited to clearly define their status.

	RED LIST	BLUE LIST
Mammals	black-footed ferret swift fox ¹ wood bison ¹ woodland caribou ^{1,3} yellow-cheeked vole	bobcat brown lemming Canada lynx cougar grizzly bear ³ mountain goat Ord's kangaroo rat prairie vole red-tailed chipmunk river otter sagebrush vole wandering shrew western small-footed bat wolverine ³
Birds	Baird's sparrow burrowing owl ¹ ferruginous hawk ¹ greater prairie chicken loggerhead shrike long-billed curlew mountain plover ^{1,2} peregrine falcon ^{1,2} piping plover ^{1,2} trumpeter swan ¹ upland sandpiper whooping crane ¹	American white pelican ¹ bald eagle bay-breasted warbler black swift Blackburnian warbler Brewer's sparrow Cape May warbler caspien tern Cooper's hawk Eskimo curlew great gray owl osprey prairie falcon turkey vulture
Reptiles	short-horned lizard western hognose snake	prairie rattlesnake western painted turtle
Amphibians	great plains toad long-toed salamander northern leopard frog	plains spadefoot toad spotted frog

¹ also listed as endangered under the Alberta Wildlife Act.

² also listed as endangered by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC), 1993. COSEWIC defines an endangered species as one at risk of imminent extinction from all or a significant part of its Canadian range.

³ also listed as vulnerable by COSEWIC, 1993. A vulnerable species under COSEWIC is in imminent danger, but is at risk for such reasons as low or declining numbers, or restricted habitat.

Sources: Fish and Wildlife, Alberta Environmental Protection, *Status of Alberta Wildlife, 1991*.

Alberta Wildlife Act.

Committee on the Status of Endangered Wildlife in Canada, *Canadian Species at Risk, April 1993*.

PLANT SPECIES

Self-perpetuating in the wild, native and non-native

	# known species	% of Canada's known species	Rare in North America	Rare in Canada
Vascular Plants	1767	42%	59	87
Non-vascular Plants (eg. mosses, lichens)	1180	approx. 10%	30-50%	30-50%

Sources: Provincial Museum of Alberta (known Alberta species).

Parks Services, Alberta Environmental Protection, *Rare Vascular Flora of Alberta, 1987* (rare species).

Environment Canada, *State of Canada's Environment 1991*, Table 6.1.(% Canadian species).

ANIMAL SPECIES

	# SPECIES	% OF CANADA'S SPECIES
Resident Mammals	90	47%
Breeding Birds	270	63%
Fish	50	5%
Reptiles & Amphibians	18	22%
Insects	20,000	30%

Sources: Hugh C. Smith, *Alberta Mammals: An Atlas and Guide, 1993*; Glen Semenchuk, *The Atlas of Breeding Birds of Alberta, 1992*; J.S. Nelson and M.J. Paetz, *The Fishes of Alberta, 1992*; A.D. Russell and A.M. Bauer, *The Amphibians and Reptiles of Alberta, 1993* (known Alberta species).

Environment Canada, *State of Canada's Environment 1991*, Table 6.1.(% Canadian species).

ALBERTA FISH AND PLANTS AT RISK, 1993

According to the Committee on the Status of Endangered Wildlife in Canada.

Endangered: threatened with imminent extinction from all or a significant part of its Canadian range

Threatened: likely to become endangered if present trends continue.

Vulnerable: at risk, but not yet threatened, for such reasons as low or declining numbers, or restricted habitat.

Fish At Risk

ENDANGERED	THREATENED	VULNERABLE
	shortjaw cisco	
	Great Lakes deepwater sculpin	

Plants At Risk

ENDANGERED	THREATENED	VULNERABLE
slender mouse-ear-cress	western blue flag	smooth goosefoot
	western spiderwort	soapweed
	sand verbena	

Source: Committee on the Status of Endangered Wildlife in Canada, *Canadian Species at Risk, April 1993*.

T HE CHANGING FACE OF THE LAND



INDUSTRY PROFILE, 1991-92

All data based on harvest from Crown land.

Solid Wood Products

type of mill (#)	markets (1992)***	timber harvested (000 m ³)
panel board (5)	15% Alberta 20% Canada 65% out of Canada	coniferous: 8,193 deciduous: 1,136
sawmills (250)	65-70% United States 20% Canada 10-15% offshore	

Pulp & Paper

type of mill (#)	markets (1992)***	timber harvested (000 m ³)
pulp & paper (6)*	14% Europe 28% far east 50% United States 6% other provinces 2% Alberta	coniferous: 1,507** deciduous: 1,024**

* does not include Alberta-Pacific, whose annual allowable cut is 2.4 million cubic metres.

** does not include 2.537 million cubic metres of woodchips, a by-product of panel-board and sawmills, that pulp mills use. If these were not available, pulp mills would have harvested more trees, perhaps as much as 9,000 more hectares of forest in 1992.

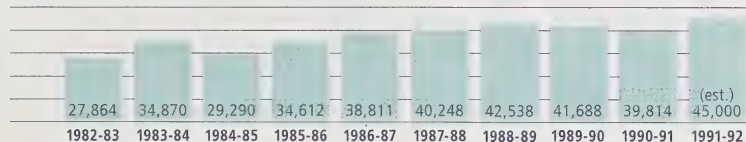
*** market percentages for lumber and panelboard are estimates. These products are generally sold through brokers and, as a result, the final destinations of the products are not always available.

Sources: Forest Industry Development, Alberta Economic Development and Tourism (market estimates for panel board and sawmills; harvest statistics summarized from 10-year production summary).
Individual mills (pulp and paper market estimates).

HARVEST 1982-1992 BY PRODUCT AND SPECIES

	SOLID WOOD PRODUCTS (000 m ³)		PULP & PAPER (000 m ³)		WOOD CHIPS* (000 m ³)
	Coniferous	Deciduous	Coniferous	Deciduous	
1982-83	4,298	119	1,012	2	853
1983-84	6,022	352	698	118	1,304
1984-85	5,329	371	744	61	1,443
1985-86	5,362	498	853	147	1,458
1986-87	6,632	688	744	79	1,452
1987-88	7,092	787	344	77	1,506
1988-89	7,842	1,075	504	207	1,506
1989-90	6,976	1,185	427	202	1,607
1990-91	9,220	1,218	1,518	1,085	2,070
1991-92	8,193	1,136	1,507	1,024	2,538

ANNUAL CUT (hectares)



* This does not indicate any additional tree harvest. Woodchips are a by-product of the manufacture of lumber. A large portion of woodchips goes into the manufacture of pulp and paper.

Source: Forest Management Division, Alberta Environmental Protection, Timber Management Statistics (92-12-31).

FOREST INVENTORY, 1991

Total forest land in Alberta:

39,539,847 hectares excluding national parks.

Forest capable of producing merchantable timber:

20,159,460 hectares (estimated as 50% of total forest land)

Potentially commercial forest:

2,158,996 hectares (estimated as 5% of total forest land)

Proportion of Canada's commercial forest in Alberta, 1986:

9%

Sources: Forest Management Division, Alberta Environmental Protection.
Environment Canada, State of the Environment Reporting.

USE OF INSECTICIDES AND HERBICIDES IN FORESTRY, 1992

Hectares treated with herbicide:

477

Hectares treated with insecticide*:

35,662 hectares treated twice for a total of **71,244** hectares

**Bacillus thuringiensis*, a biological insecticide used to control spruce budworm.

Source: Forest Management Division, Alberta Environmental Protection.

What Do You Know?

What percentage of the area harvested in the Green Area must be reforested to legislated requirements?

- a) 50% b) 75% c) 80% d) 100%

Answer: d. 100%. All areas harvested in the Green Area are monitored to ensure that they are successfully regenerated. Under 1991 regulations, reforestation monitoring occurs in two stages:

- 1) an "establishment survey" done four to eight years after harvest for coniferous and mixedwood cutblocks; three to five years after harvest for deciduous cutblocks.*
- 2) a "performance survey" done eight to 14 years after harvest for coniferous and mixedwood cutblocks only.*

To pass each survey, a cutblock must meet standards concerning the commercial species present, the density of regrowth and the height of the new trees. The surveys locate areas, over four hectares in size, that are satisfactorily restocked and those areas that are not satisfactorily restocked. The performance survey also assesses what parts of a cutblock are "free to grow," or not so dense that trees compete for resources.

Those areas that do not meet the legislated requirements must be re-treated and re-surveyed until the standards are met.

Source: Forest Management Division, Alberta Environmental Protection.



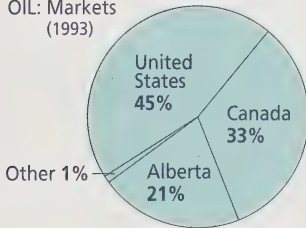
E ENERGY AND MINING

INDUSTRY PROFILE

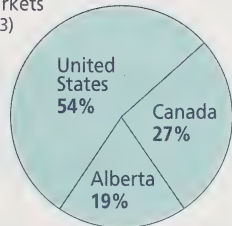
OIL AND GAS, 1993

EXTRACTION SITES	# REFINERIES (1993)	PRODUCTION (1993) (000 CUBIC METRES)
Oil Wells: 63,625	Oil: 5	84,607.5
Commercial Oil Sands Mines: 2		
	Gas Plants: 550	145,788.2

OIL: Markets
(1993)



GAS: Markets
(1993)



ELECTRICITY, 1992

GENERATION TYPE	# PLANTS	CAPACITY (MEGAWATTS)	MARKET
Conventional Generation			
hydro	14	797	100% Alberta
coal-fired	7	5299	100% Alberta
natural-gas-fired	18	1195	100% Alberta
fuel-oil-fired	16	8	100% Alberta
Small Power Generation			
small hydro	6	48	100% Alberta
waste-wood-fired	2	41	100% Alberta
peat-fired	2	40	100% Alberta
wind	9	21	100% Alberta
municipal-waste-fired	1	2.4	100% Alberta

COAL MINING

# MINES (1993)	PRODUCTION (1993) (000 TONNES)	MARKETS (1992)
17	38,401	64% Alberta 5% Canada 30% outside Canada

OTHER MINING

	# EXTRACTION SITES (1990)	PRODUCTION (1992) (000 TONNES)
Peat	17	94
Salt	5	1,271
Clay	12 (also some in association with sand & gravel)	data not available
Limestone	5	Lime: 191 Cement: data not available
Sand and Gravel	approx. 400	38,094
Dimensional Stone (for building)	2	316

Sources: Energy Resources Conservation Board (oil and gas); Annual Statistics, Alberta Electric Industry (all statistics on conventional electricity generation); ERCB ST93-26 (coal production statistics).

Statistics Canada (all production numbers except coal.)



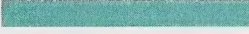
Alberta Energy, Electricity Policy Branch (all statistics on small power generation); Mineral Resources Division (# mines and extraction sites for coal and other mining).

CUMULATIVE LAND DISTURBANCE AND RECLAMATION

	LAND DISTURBED (HECTARES)	RECLAIMED	YEAR END
Oil & Gas Wells	160,000	37,000 well sites of 57,000 possible	1992
Coal Mines	13,000	5,500 hectares	1992
Oil Sands Mines	13,000	2,000 hectares	1992
Pipelines	8,000	6,000	1992
Sand & Gravel	private land: 18,800 public land: data not available	private land: 53 pits of 3,477 possible	1992

Source: Land Reclamation Division, Alberta Environmental Protection.

STATUS OF OIL AND GAS WELL SITES, 1992

Active (producing)	54,000	
Suspended (not producing now)	35,000	
Abandoned	73,000	

Source: Energy Resources Conservation Board.

CUTLINES FROM OIL AND GAS SEISMIC EXPLORATION IN ALBERTA'S "GREEN AREA," 1986-1992

Alberta's "Green Area" is not settled and is generally forested.

Kilometres Approved for Cutlines

1986	1987	1988	1989	1990	1991	1992
44,831	57,270	46,852	44,982	51,542	24,556	27,409

Approximate Area of Cutlines

1986	1987	1988	1989	1990	1991	1992
200 km ²	300 km ²	200 km ²	200 km ²	300 km ²	100 km ²	100 km ²

Seismic lines must be reclaimed, but reclamation data is not available.

Source: Forest Management Division, Alberta Environmental Protection.

What Do You Know?

What uses the most energy in the average Canadian home?

- a) home heating b) personal car c) water heating d) appliances

Answer: a. Home heating accounts for 42% of energy use in the average Canadian home. Cars run a close second at 39%, followed by 10% for appliances and 9% for water heating.

Source: Environment Canada, *The State of Canada's Environment 1991*, p. 12-10.

What is the biggest electricity user in the average Alberta home?

- a) lights b) refrigerator c) furnace fan d) stove

Answer: b. The average frost-free refrigerator takes up 22% of total electrical demand of the average Alberta home. Lights use 10%, furnace fans use 12% and stoves use 17%.

Source: Environmental Affairs Branch, Alberta Energy.



INDUSTRY PROFILE, 1991

# FARMS	TOTAL AREA (000 HECTARES)	USE OF LAND (000 HECTARES)
57,245	20,811 hectares	unimproved pasture: 6,674 (mostly beef) wheat: 3,122 barley: 2,187 improved pasture: 1,742 (mostly beef) canola: 1,207 alfalfa: 1,013 hay: 710 oats: 520 other: 186

PRODUCTION (000 TONNES)	OUT-OF-CANADA EXPORTS (000 TONNES)	% PRODUCTION EXPORTED
Beef 376	beef – meat: 39 (also exported as meat products & cattle)	at least 10%
Wheat 7,773	wheat – unmilled: 6,205 (also exported as flour)	at least 80%
Barley 5,879	1,951	33%
Canola 1,622	canola – seed: 707 (also exported as oil)	at least 44%
Alfalfa no data	dehydrated: 303	no data
Hay 8,165	not exported	0%
Oats 787	216	28%

Top five export markets in order of priority: United States (\$787 million), Japan (\$469 million), USSR (\$351 million), China (\$257 million), South Korea (\$52 million).

Sources: Statistics Canada, *1991 Census of Agriculture for Alberta* (land-use numbers).

Alberta Agriculture, Food and Rural Development, *Alberta's Agricultural Exports 1992* (1991 production and export numbers).

INVENTORY OF AGRICULTURAL LAND

Based on Canada Land Inventory (CLI) classes.

Prime land for cultivation (CLI 1-3): **10,729,949 hectares**
% of Canada's prime land: **22%.**

Marginal for cultivation (CLI 4): **9,279,576 hectares.**

Suitable for pasture and hay (CLI 5): **11,093,057 hectares.**

Suitable for wild pasture (CLI 6): **3,930,670 hectares.**

Sources: Lands Directorate, Environment Canada, *Agricultural Land Use Change in Canada, 1982* (Alberta inventory).
Environment Canada, State of Canada's Environment 1991, Figure 9.3. (% of national totals).

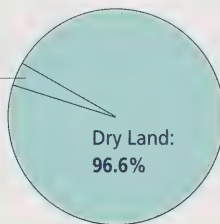
CULTIVATED LAND, 1991 (000 HECTARES)

Total **12,806**

Irrigated **433**

Dry Land **12,372**

Irrigated: 3.4%



Source: Alberta Agriculture, Statistics Yearbook, 1991.

What Do You Know?

Where is most of Canada's irrigated land?

- a) British Columbia b) Alberta c) Saskatchewan d) Ontario

Answer: *b. Alberta has 62% of Canada's irrigated land. Other provinces in Canada: British Columbia (16%), Saskatchewan (11 %), Ontario (7%).*

Source: Statistics Canada, 1986 Census.

Irrigation consumes what percentage of total licensed water allocation in Alberta?

- a) 2% b) 53% c) 83% d) 99%

Answer: *c. In 1991, irrigation consumed 83%. Other consumptive uses: municipalities (4%), industrial (3%), thermal power (3%), enhanced oil recovery (2%).*

Source: Alberta Environmental Protection, Planning Division.

ADDITIONS AND DELETIONS TO AGRICULTURAL LAND BASE, 1976-1990

Temporary (T) & Permanent (P)

Canada Land Inventory Class	1,2,3 (prime)	4,5,6 (marginal)
Additions (000 hectares):		
Disposition of public land (P)	53.3	110.8
Abandoned well sites (T)	10.2	54.7
Reclamation (T)	1.9	1.8
Deletions (000 hectares):		
Urban annexation (P)	64.5	34.9
Oil and gas activity (T)	40.5	57.4
Residential subdivision (P)	28.9	15.1
Transportation (P)	11.0	21.5
Resource extraction (T)	6.5	9.5
Industrial / commercial (P)	4.5	5.2
Net change	143.8 loss	23.7 gain

Source: Alberta Agriculture, Food and Rural Development, *Agricultural Land Base Monitoring Study 1986-1990*.

ESTIMATED AREA OF EASILY DEGRADED SOILS UNDER CULTIVATION IN ALBERTA, 1987

At risk of severe wind and water erosion: **3.7 million hectares total.**

Prime land (Canada Land Inventory 1-3): **2.0 million hectares**

Marginal land (Canada Land Inventory 4-6): **1.6 million hectares.**

At risk of developing secondary dryland salinity resulting in a 50% drop in yields:
0.2 million hectares.

Source: Prairie Farm Rehabilitation Administration.

What Do You Know?

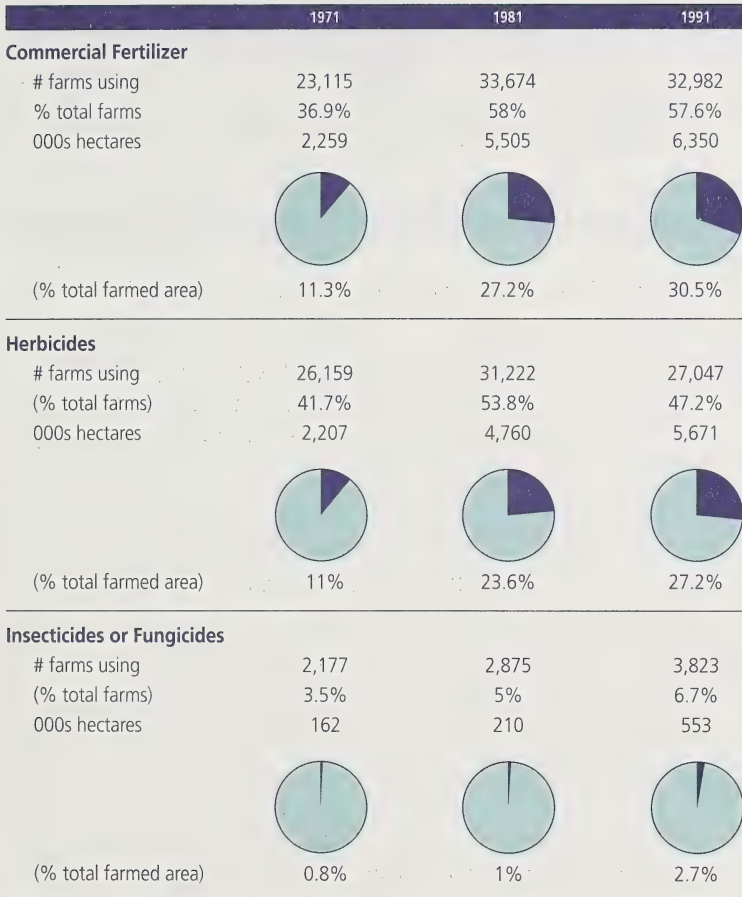
How much money do Alberta farmers lose annually because of soil degradation?

a) \$256 million b) \$351 million c) \$429 million d) \$550 million

Answer: c.

Source: Conservation and Development Branch, Alberta Agriculture, Food and Rural Development.

USE OF AGRICULTURAL CHEMICALS, 1971-1991



Source: Statistics Canada, *Census Overview of Canadian Agriculture, 1971-1991*.



URBANIZATION AND TRANSPORTATION

URBAN GROWTH IN SELECTED ALBERTA CITIES, 1981-1991

	1981	1986	1991
Calgary			
Area	505 km ²	535 km ²	697 km ²
Population	592,743	636,104	710,675
Edmonton			
Area	322 km ²	670 km ²	670 km ²
Population	532,246	573,982	616,741
Grande Prairie			
Area	42 km ²	42 km ²	42 km ²
Population	24,263	26,471	28,270
Lethbridge			
Area	63 km ²	116 km ²	120 km ²
Population	54,072	58,841	60,975
Red Deer			
Area	52 km ²	52 km ²	52 km ²
Population	40,393	54,425	58,135

Source: Statistics Canada, Census data 1981, 1986, 1991.

What Do You Know?

In 1992, low-density (single-family) housing accounted for an average of 49% of new residential construction in Canadian metropolitan areas. Single-family homes accounted for what percentage of new construction in Calgary?

- a) 25% b) 55% c) 75% d) 85%

Answer: d. Edmonton also had a high percentage of single-family home starts in 1992: 69%.

Source: Canadian Mortgage and Housing Corporation, Canadian Housing Statistics 1992.

How much land do highways and local roads, excluding city streets, take up in Alberta?

- a) 200 km² b) 1,500 km² c) 4,600 km² d) 10,000 km².

Answer: c. An area more than six times the size of Edmonton.

Source: Construction Programming Branch, Alberta Transportation and Utilities, 1992/93 road inventory summary and width estimates.

URBANIZATION OF FARM LAND IN CANADA, 1966-86

PROVINCE	TOTAL LAND URBANIZED (000 HECTARES)	PRIME LAND URBANIZED (000 HECTARES)	% OF PROVINCIAL PRIME LAND URBANIZED
British Columbia	45	9	0.3%
Alberta	52	32	0.02%
Saskatchewan	11	7	0.03%
Manitoba	13	11	0.2%
Ontario	106	83	1.0%
Quebec	51	25	1.0%
New Brunswick	11	2	0.1%
Nova Scotia	8	3	0.2%
Prince Edward Island	2	2	0.4%
Newfoundland	3	negligible	negligible

Source: Environment Canada, The State of Canada's Environment 1991, Figure 9.5.



AREAS WITH LEGISLATED PROTECTION, 1993

	# SITES	COMBINED AREA (KM ²)
National Parks	5	54,084
Forest Land Use Zones	10	5,024
Willmore Wilderness Park	1	4,597
Provincial Parks	65	1,427
Forest Recreation Areas	173	1,214
Wilderness Areas	3	1,010
Provincial Bird Sanctuaries	7	722
Provincial Recreation Areas	200	599
National Wildlife Areas	4	424
Natural Areas	123	379
Ecological Reserves	14	271
Provincial Wildlife Sanctuaries	2	191
Migratory Bird Sanctuaries	4	142
Wildlife Habitat Development Areas	2	23
Provincial Historic Resource Natural Sites	6	10
National Historic Sites	6	2
TOTALS	625	70,119

Percentage of province protected in these sites: approximately 11%.

Source: Parks Services, Alberta Environmental Protection.

What Do You Know?

About how many tourists visited Alberta's national parks in 1991-92?

- a) 5 million b) 10 million c) 12 million d) 18 million

Answer: b.

Source: Environment Canada, national parks attendance statistics.

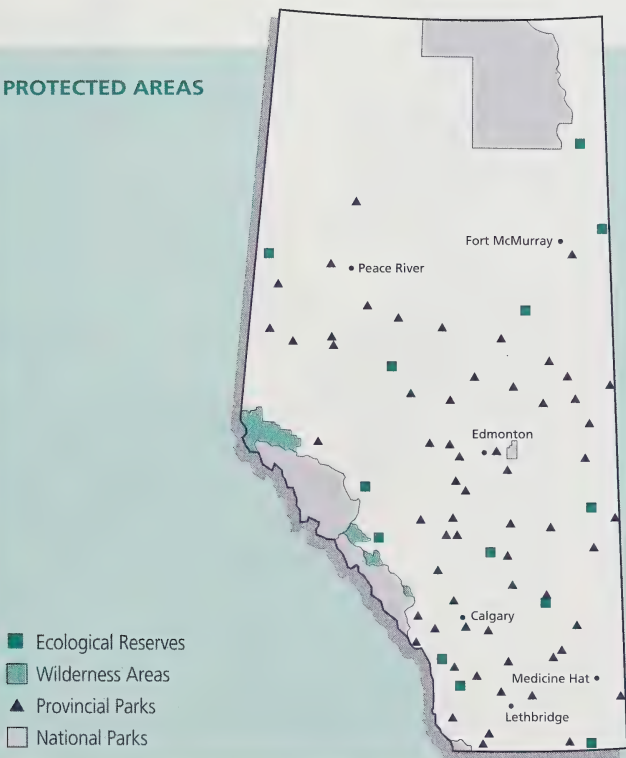
In 1992, where did overnight camping rank as a recreation activity for Albertans?

- a) first b) third c) fifth d) tenth

Answer: b. It ranked third out of ten activities. The other ten activities, in order, were: walking, driving, cycling, being a spectator, swimming, doing crafts, visiting museums, picnicking, skating.

Source: Alberta Economic Development and Tourism, 1992 Alberta Recreation Survey.

PROTECTED AREAS



Source: Adapted from, Environment Council of Alberta, *Protecting Ecosystems in Alberta*.

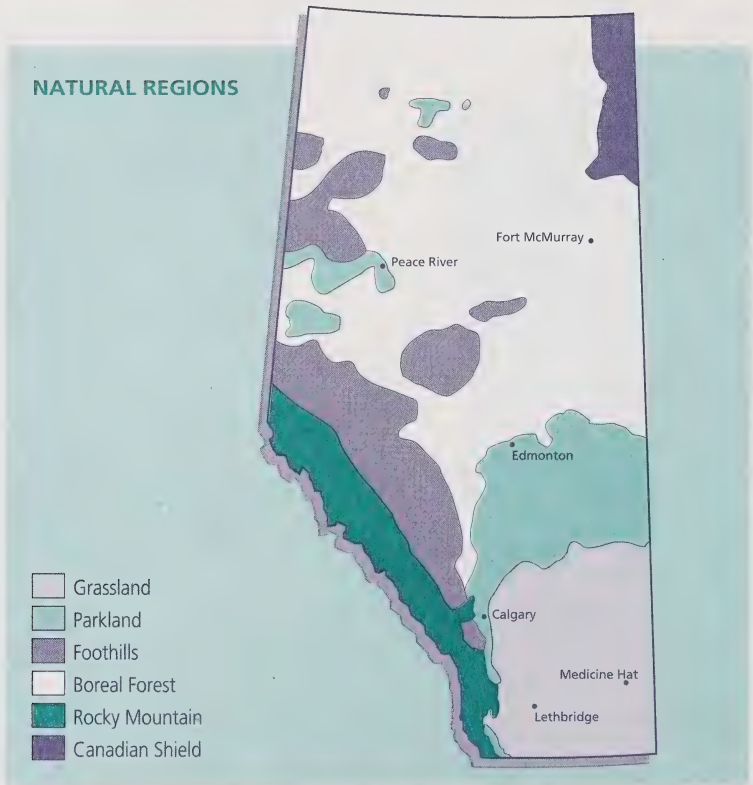
What Do You Know?

What natural Alberta sub-region will be most difficult to protect adequately because only fragments remain in a natural state?

- a) Peace River Parkland b) Kazan Upland c) Northern Fescue d) Grassland

Answer: a. The Peace River Parkland will be most difficult to protect because almost all of it is cultivated. By contrast, though none is protected now, the Kazan Uplands subregion of the Canadian Shield is still untouched. Large tracts of the Grasslands region are also still in excellent condition because only grazed.

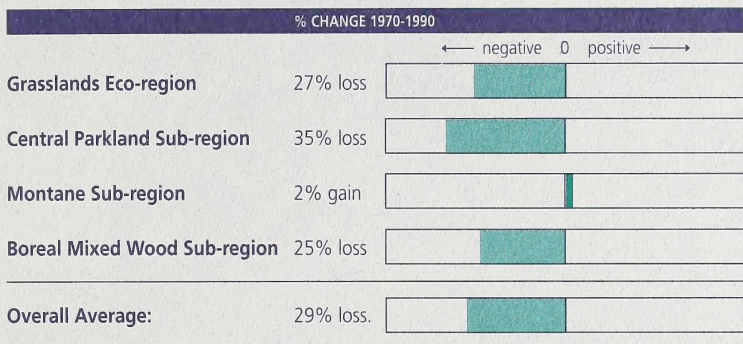
Source: Alberta Parks Service, Alberta Environmental Protection.



Source: Environment Council of Alberta, *Saving the Strands of Life, Alberta's Biodiversity*, 1992.

WETLAND LOSSES IN SETTLED AREA BY NATURAL REGION, 1970-1990

Alberta's settled area is called the "White Area."



Approximately 70% of change is due to human activity, 30% to drier climate.

Estimated loss of Alberta's wetlands in White Area since settlement: 63%.

Source: Planning Division, Alberta Environmental Protection, *Characterization of Wetlands in the Settled Areas of Alberta*, 1993.

INVENTORY OF WETLANDS, 1991

Total area of wetlands: **13,704 hectares**.

% of province's area:

21%

% of Canada's wetlands:

11%

Source: Statistics Canada, *Human Activity and the Environment*, 1991.

What Do You Know?

From 1981-1987, the estimated rate of wetland loss in Saskatchewan and Manitoba was 0.2%. What was Alberta's rate?

- a) 0.1% b) 0.2% c) 0.4% d) 0.5%

Answer: *d.*

Source: Planning Division, Alberta Environmental Protection, *Characterization of Wetlands in the Settled Areas of Alberta*, 1993.

What percentage of North America's duck population nests in Alberta's wetlands?

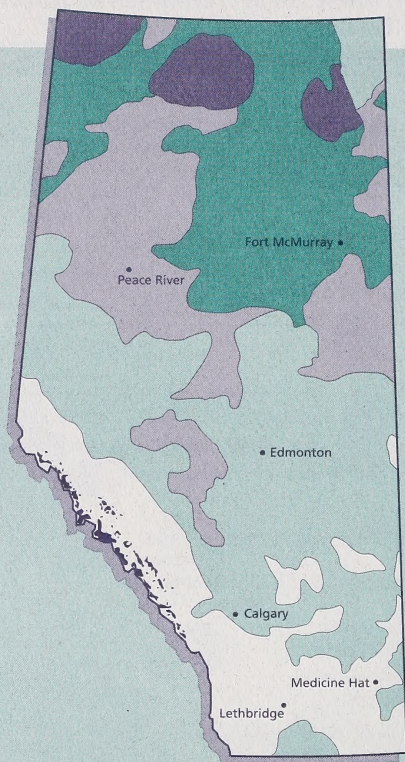
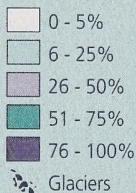
- a) 5% b) 10% c) 20% d) 25%

Answer: *c. About 20% of the continent's ducks nest in Alberta's wetlands. Fifty to 70% of all North America's ducks nest in the prairie provinces' wetland areas.*

Source: Canadian Wildlife Service.

DISTRIBUTION OF WETLANDS

PERCENTAGE COVER OF WETLANDS



Source: Energy, Mines and Resources Canada, *The National Atlas of Canada 5th Edition*.

Alberta Facts: A Guide to the Environment is intended to be a quick reference handbook of statistics on Alberta's environment. For more in-depth information on any of its subject areas, please contact the sources cited in the handbook.

For a more comprehensive review of Alberta's environment, you may also wish to consult the various state of the environment reporting products produced by the Department of Environmental Protection in consultation with the Department of Energy, the Department of Agriculture, Food and Rural Development and the Department of Health. For more information, please contact:

Community Relations
Alberta Environmental Protection
9th floor, South Petroleum Plaza
Edmonton, Alberta
T5K 2C9

Tel. (403) 427-6267

National Library of Canada
Bibliothèque nationale du Canada



3 3286 50556 9364

ISSN 1198-7162

The paper used in this booklet contains 50% recycled
fibre and a minimum of 15% post-consumer waste.